

REMARKS

Claims 2 and 4-27 currently appear in this application. The Office Action of January 30, 2002, has been carefully studied. It is believed that all of the claims are allowable, and favorable action is earnestly requested.

Drawings

The drawings are objected to because there is writing in a foreign language on the figures, and figures 22 and 23 should be designated as "prior art." Reference character "32" has been used to designate both n-type semiconductor layer and yellow light.

Submitted herewith are proposed drawing corrections. The specification has been amended to denote the n-type semiconductor as "23", which is the designation given on page 13, line 9.

Art Rejections

Claims 1-7, 9-14 and 16-24 are rejected under 35 U.S.C. 102(e) as being anticipated by Hide et al.

This rejection is respectfully traversed. The present invention is directed to a light emitting diode in which a fluorescent material containing layer is arranged on a back side of a light emitting diode element. Claims 1 and 3 have been rewritten as claims 26 and 27, respectively, and all of the other claims depend from claim 26 or 27. Hide discloses a photoluminescent film 34 which is positioned in the path of light output 30, not on the back of a light

emitting diode element. In the present invention, the fluorescent material containing layer is arranged on the back side of the light emitting diode element so that the light from the light emitting diode element is converted in waveform at the back side of the light emitting diode. This obviates the need for a fluorescent material to be dispersed in the resin seal member which protects the surface side of the light emitting diode element, therefore improving the light transmittance of the resin seal member, allowing an increase in the light intensity of the light emitting diode.

Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hide et al. The Examiner concedes that Hide et al. do not disclose that the fluorescent material is an yttrium compound.

This rejection is respectfully traversed. As noted above, the present invention is directed to a light emitting diode in which a fluorescent material containing layer is arranged on the back side of a light emitting diode element. There is nothing in Hide et al. which suggests this arrangement, as the photoluminescent material in Hide et al. is positioned above the light emitting diode. Therefore, the fact that one could use an yttrium compound as the fluorescent material is immaterial, as the structure of the claimed invention is altogether different from the Hide et al. structure.

Claims 15 and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hide et al. and further in

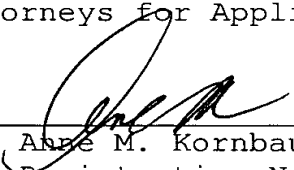
In re Appl. No. 09/763,421  
Confirmation No. 9136

view of Shimizu et al. The Examiner admits that Hide et al. do not disclose a pair of electrodes arranged on the base, and cites Shimizu et al. for disclosing a light emitting device which a p electrode and an n electrode are connected to metal terminals on a base through conductive wires.

This rejection is respectfully traversed. Shimizu et al. add nothing to Hide et al., as there is no teaching or suggestion in Hide et al. of locating the fluorescent material containing layer on the bottom of a light emitting diode element.

In view of the above, it is respectfully submitted that the claims are now in condition for allowance, and favorable action thereon is earnestly solicited.

Respectfully submitted,  
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"Version with markings to show changes"

IN THE SPECIFICATION

Page 5, please amend the third paragraph lines 15-18 as follows:

According to this invention, the dispersion of the fluorescent material into the ~~adhesion~~adhesive makes it possible to arrange the fluorescent material simultaneously during the process of adhesive bonding the light emitting diode element.

Page 13, please amend the first paragraph lines 1-13 as follows:

A light emitting diode element 20 is mounted on the topside center of the above-mentioned glass epoxy substrate 12, and is fixed to the glass epoxy substrate 12 with a fluorescent material containing layer 21 applied to its back side. This light emitting diode element 20 is a blue light emitting element made of gallium nitride type compound semiconductor. As shown in Fig. 3, it has a structure in which an n-type semiconductor ~~32~~23 and a p-type semiconductor 24 are grown on the top surface of a sapphire substrate 22. The n-type semiconductor 23 and the p-type semiconductor 24 are provided with electrodes 25 and 26, and connected to the topside electrodes 13 and 14 arranged on the above-

mentioned glass epoxy substrate 12 with bonding wires 27 and 28 for blue luminescence.

IN THE CLAIMS

2. (Amended) The light emitting diode according to claim ~~1, characterized in that~~26, wherein said light emitting diode element is a light emitting diode for blue luminescence, made of gallium nitride type compound semiconductor or SIC type compound semiconductor.

4. (Amended) The light emitting diode according to claim ~~1 characterized in that~~26, wherein said fluorescent material containing layer is composed of a fluorescent material dispersed into an adhesive; and a back of said light emitting diode element is firmly fixed to said base by the adhesive action of said fluorescent material containing layer.

5. (Amended) The light emitting diode according to claim ~~1 characterized in that~~26, wherein said fluorescent material containing layer is formed with a fluorescent material and an adhesive separate from each other; and a fluorescent material containing resin layer

and an adhesive layer are formed in layers on a top surface of said base.

6. (Amended) The light emitting diode according to claim 4, ~~characterized in that~~wherein said fluorescent material containing layer is formed on the top surface of said base by printing means.

7. (Amended) The light emitting diode according to claim 1, ~~characterized in that~~26, wherein said fluorescent material containing layer is a fluorescent material containing resin sheet pasted on a top surface of said base.

8. (Amended) The light emitting diode according to claim 4, ~~characterized in that~~wherein said fluorescent material is an yttrium compound.

9. (Amended) The light emitting diode according to claim 1, ~~characterized in that~~26, wherein a periphery of said fluorescent material containing layer is surrounded by a dam provided on a top surface of said base.

10. (Amended) The light emitting diode according to claim ~~1, characterized in that~~26, wherein a reflecting surface is arranged on a bottom side of said fluorescent material containing layer or a top surface of said base.

11. (Amended) The light emitting diode according to claim ~~1, characterized in that~~26, wherein an upward reflecting surface tilting outward is arranged around said light emitting diode elements.

12. (Amended) The light emitting diode according to claim ~~1, characterized in that~~26, wherein a lens portion of convex shape is formed on a top side of said resin seal member.

13. (Amended) The light emitting diode according to claim ~~1, characterized in that~~26, wherein said resin seal member is formed flat at a top side; and a fluorescent material containing layer is formed on the top side.

14. (Amended) The light emitting diode according to claim ~~1, characterized in that~~26, wherein said base is a glass epoxy substrate, a solid-molded

substrate of liquid crystal polymer, or a sheet metal substrate.

15. (Amended) The light emitting diode according to claim ~~1, characterized in that:~~ 26, wherein said light emitting diode element is connected to a pair of electrodes arranged on said base; and said electrodes are surface-mounted directly to printed wires on a motherboard.

16. (Amended) The light emitting diode according to claim ~~3, characterized in that:~~ 27, wherein said fluorescent material containing layer is composed of a fluorescent material dispersed into an adhesive; and a back of said light emitting diode element is firmly fixed to said base by the adhesive action of said fluorescent material containing layer.

17. (Amended) The light emitting diode according to claim ~~3, characterized in that:~~ 27, wherein said fluorescent material containing layer is formed with a fluorescent material and an adhesive separate from each other; and a fluorescent material containing resin layer and an adhesive layer are formed in layers on a top surface of said base.



18. (Amended) The light emitting diode according to claim ~~3, characterized in that~~27, wherein said fluorescent material containing layer is a fluorescent material containing resin sheet pasted on a top surface of said base.

19. (Amended) The light emitting diode according to claim ~~3, characterized in that~~27, wherein a periphery of said fluorescent material containing layer is surrounded by a dam provided on a top surface of said base.

20. (Amended) The light emitting diode according to claim ~~3, characterized in that~~27, wherein a reflecting surface is arranged on a bottom side of said fluorescent material containing layer or a top surface of said base.

21. (Amended) The light emitting diode according to claim ~~3, characterized in that~~27, wherein an upward reflecting surface tilting outward is arranged around said light emitting diode elements.

22. (Amended) The light emitting diode according to ~~claim 3, characterized in that~~claim 27,

wherein a lens portion of convex shape is formed on a top side of said resin seal member.

23. (Amended) The light emitting diode according to claim ~~3, characterized in that:~~ 27, wherein said resin seal member is formed flat at a top side; and a fluorescent material containing layer is formed on the top side.

24. (Amended) The light emitting diode according to claim ~~3, characterized in that~~ 27, wherein said base is a glass epoxy substrate, a solid-molded substrate of liquid crystal polymer, or a sheet metal substrate.

25. (Amended) The light emitting diode according to claim ~~3, characterized in that:~~ 27, wherein said light emitting diode element is connected to a pair of electrodes arranged on said base; and said electrodes are surface-mounted directly to printed wires on a motherboard.